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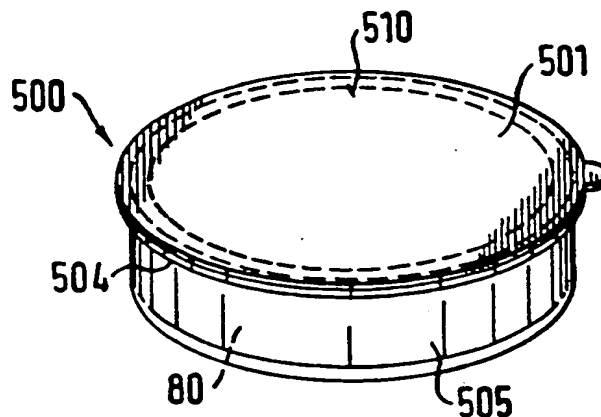
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(54) **Solid block wash chemical container.**

(57) The invention relates to an article of commerce comprising a solid wash chemical contained in a vessel (500). The article comprises a three-dimensional, solid substantially orthogonal block (80) of wash chemical and a substantially orthogonal vessel (500) having an open face (501) and leading edge, the vessel (500) surrounding and in contact with the block (80) of wash chemical on all but one surface thereof, the vessel being distortable to break bonds holding the solid block (80) of wash chemical in the vessel (500) until such distortion and the cross-sectional area of the open face (501) being sufficient to allow passage of the entire block (80) of wash chemical therethrough.

**Fig. 1****EP 0 462 624 A1**

Technical Field

The invention relates broadly to the dispensing of solid water soluble compositions used in cleaning processes. More particularly, the invention relates to the dispensing of wash chemical compositions in a solid, a block or a cast form. Such wash chemicals include detergents, rinse aids, and the like. Typically in use the solid wash chemical composition can be contacted with an aqueous liquid to create a concentrated working solution.

Background of The Invention

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Automated institutional and industrial warewashing machines are generally configured with one wash tank for maintaining a readily available supply of a cleaning solution for use in the machine. During normal usage, at least a portion of, or all of, the used cleaning solution is discarded in order to keep the cleaning solution as clean as possible. Fresh water or other clean recycled water can be added to the wash tank to maintain an appropriate liquid level, thereby diluting the concentration of detergent in the solution. To obtain a cleaning solution at the most efficient cleaning concentration, a measured amount of a concentrated aqueous detergent solution can be periodically added to the reservoir by an auxiliary detergent dispenser where it is mixed with the fresh or recycled rinse water to form a cleaning solution of the desired strength.

Automated institutional and industrial ware washing machines can add a rinse aid to the rinse water to promote sheeting and reduce water spotting on the washed ware using an auxiliary rinse aid dispenser.

Automated institutional and industrial fabric washing machines typically create a new cleaning solution for each cleaning cycle to which is added detergent, bleach, fabric softener, and other additives. Accordingly, fabric washing additives are added to the wash water by auxiliary dispensers. Wash chemical dispensers, used in processes as described above, typically have been designed for automatic or semiautomatic operation. The automated dispensers eliminates the need for constant operator attention to the cleanliness of the wash water and concentration of cleaner in the wash tank. Further, automated dispensers minimize operator error due to operator misjudgment in timing or in the amount of wash chemical to be added to the wash tank, and provides greater accuracy in maintaining the optimum concentration level of wash chemicals in the systems.

A number of different techniques have been developed and used for converting a solid wash chemical into a concentrated wash chemical solution. The majority of such devices have been designed to convert solid detergent from its "powdered" form. See for example Daley et al, U.S. Pat. No. 3,595,438, issued July 27, 1971; Moffet et al, U.S. Pat. No. 4,020,865, issued May 3, 1977; and Larson et al, U.S. Pat. No. 4,063,663, issued Dec. 20, 1977. For this reason wash chemical dispensers will be discussed with respect to the dispensing of detergents. One detergent dispenser technique for converting powdered detergent, is the so-called "water-in-reservoir" type. In the water-in-reservoir dispenser, the powdered detergent is completely submerged in an aqueous solution. A stand-pipe, usually located near the center of the dispenser tank, maintains a constant water/solution level within the dispenser tank. As water is added to the dispenser tank, a concentrated, often saturated detergent solution or slurry is formed by the swirling action or agitation of the powdered detergent by the injected water. The added water also causes a portion of the solution or slurry in the reservoir to flow into stand-pipe, which supplies the wash tank of the washing apparatus with the wash chemical. Such techniques are not practical for use with powdered detergents containing incompatible components (such as an active chlorine source in combination with a defoamer) as they tend to react upon contact when in solution. Further, there may be safety hazards involved with the use of such dispensers. Charging or recharging of such dispensers requires an operator to place detergent directly into standing water. Since the water-in-reservoir type of dispensers are typically mounted at about eye level or higher with respect to the operator, any splashing or splattering caused by adding the detergent directly into the concentrated solution poses the danger of spraying concentrated detergent solution onto the eyes, face and skin of the operator.

Another technique for converting a powdered detergent into a concentrated detergent solution, involves the technique of placing the powdered detergent over the convex side of a conical or hemispherical screen having a mesh size smaller than the powdered detergent which directly overlies the support screen is dissolved as needed, by a fine mist or spray of water from a nozzle disposed below and on the concave side of the screen. The concentrated detergent solution formed by the action of the water falls by gravity into an underlying reservoir, or is directed by a conduit to the wash tank of the washing apparatus. (See, f. e., U.S. Pat. Nos. 3,595,438 issued to Daley et al; 4,020,865 issued to Moffat et al; and 4,063,663 issued to Larson et al). This technique solves many of the problems associated with the water-in-reservoir type of dispenser as (i) the entire charge of powdered detergent is not wetted, and (ii) an operator loading

detergent into the dispenser is not placing detergent directly into standing water and therefore is not subjected to possible boil-over or splattering of the detergent solution.

While the powdered detergent dispensers such as described by the Daley, Moffat and Larson patents have represented significant contributions to the art of detergent dispensing, the use of solid detergent in powdered form has a number of drawbacks in commercial applications. Due to increased sanitary standards and demands for shorter wash times, recently developed powdered detergents have relatively more complex detergent compositions that are more hazardous to the user, less stable and more difficult to dissolve in a satisfactorily uniform manner. Powdered detergents dissolve generally readily because of their high specific surface areas. However, when such powdered detergents include a mixture of a number of components having relatively different dissolving rates, such detergents are susceptible to differential solubility problems in automatic detergent dispensers, depending upon the rate of dispensing or the residence (dwell) time of contact between the detergent powder and the dissolving liquid. Those particles having a greater rate of solubility and/or a greater specific surface tend to dissolve first, whereas those having a lower solubility rate and/or a lower specific surface tend to dissolve last. Another problem associated with powdered detergents is the incompatibility and/or instability of particular detergent components required for good cleaning action, when these components are mixed and added to a powdered detergent composition.

Another problem inherent in powdered detergent is segregation of different sized particles during manufacturing, shipping and handling. Even when uniform distribution can be achieved during manufacture, subsequent shipping and handling may cause segregation, leading to non-uniformity in the composition of the detergent when it is withdrawn from the container. Another disadvantage of powdered detergents when handled in bulk form is that they are quite susceptible to spillage onto the floor, on the washing machine, etc. by the user.

Another form of solid detergent is the briquette form, comprising pre-shaped briquettes of solid detergent. Dispensing systems for dissolving detergent briquettes are known in the art. See, for example, U.S. Pat. No. 2,382,163, 2,382,164 and 2,382,165 all issued Aug. 14, 1945 to MacMahon, and U.S. Pat. No. 2,412,819 issued Dec. 17, 1946 to MacMahon. In the MacMahon systems, the detergent briquettes are dispensed from a modified water-in-reservoir dispenser wherein a number of the briquettes are held in a mesh basket forming a slot across the diameter of the reservoir. A stream of water directed against the lowermost briquette, in combination with the swirling action of water engaging the submerged portion of the lowermost briquette provides the dissolving action. The primary advantage of using detergent briquettes in such dispensers is that the user can visually determine when the detergent dispenser reservoir needs a replenishing charge of detergent. As with the water-in-reservoir type of dispenser, however, water is left standing in the reservoir, and a portion of the briquettes are submerged within that water. Accordingly, where there are incompatible components within the detergent briquettes, there can be undesirable interaction therebetween. Further, if the detergent contains a defoamer, that defoamer tends to float to the top of the reservoir during the periods of inactivity, forming a slag at the water surface. For these and other reasons, the briquette detergent approach has not attained that degree of commercial success in the conventional institutional and industrial washing machine art, as has the powdered detergent dispensing approach.

Still another, more recent form, of solid detergent is the "cast" or block form comprising detergent cast within a mold or container. Dispensing systems for dissolving these cast solids are known in the art. See, for example, U.S. Pat. No. 4,426,362 issued to Copeland et al and commonly owned copending U.S. patent applications Serial No. 234,940 and 509,916. The cast detergent is dispensed from a dispenser wherein a solvent is sprayed onto the detergent block held within its container, impinging upon at least one exposed surface of the detergent to form a concentrated working solution. The concentrated working solution falls into a reservoir or is directed by a conduit to the wash tank of the washing apparatus. When the chemical compound within the container is completely utilized, the exhausted container can be removed and a fresh container can be placed in the dispenser. Additional features have been sought by users of solid block dispensers including (i) an increase in the number of solid blocks of detergent capable of being held by the dispenser (i.e the ability to add additional blocks without having to wait until the present block is completely used), (ii) providing a relatively constant wash chemical dispensing rate, and (iii) reducing the unit cost of the wash chemical.

Accordingly, a need exists for a solid wash chemical contained in a vessel, suitable for a dispensing apparatus which can simply, safely, efficiently and inexpensively dispense a homogeneous, uniform, concentrated wash chemical solution from a solid block of wash chemical at relatively constant concentrations.

## Containers

Containers utilized for storing and dispensing of solid wash chemicals depend upon the form of the solid detergent. Flaked or granular wash chemicals are typically packaged in sturdy paper board containers, which are treated to prevent the passage of moisture into package. Typically, the granular wash chemical is dispensed from the box by either (i) ripping a hole in the box or (ii) opening a reclosable spout provided on a side panel of the box. This type of container is unsuitable for nonflowing, solid block wash chemicals.

Containers for solid tablet or briquette wash chemicals typically take the form of paper or plastic wrappers which completely surround the tablet or briquette. The wash chemical is dispensed by removing the wrapper entirely and placing the tablet or briquette into the dispenser. The drawbacks associated with this type of container for wash chemicals are: (i) they require physical contact of the skin with the wash chemical which should be avoided, and with some compositions such as highly alkaline compounds, can cause severe "burns", and (ii) the wash chemical must be formed in one step and packaged in a second step, requiring additional packing time and expense.

Solid, cast wash chemicals are preferably cast in a sturdy solid plastic container which can act both as a mold and as a dispenser housing. The cast wash chemical can be dispensed by inverting the container in the dispenser and impinging solvent directly into the container and onto the exposed surface or surfaces of the wash chemical.

Hazardous chemicals such as highly alkaline detergents are preferably packaged such that they can be dispensed without coming into physical contact with the human body. The paper and/or plastic wrappers typically utilized with tablet and briquette solid detergents are not adequate for this purpose as they require a large amount of handling to remove the wrapper and place the tablet or briquette into the dispenser after the wrapper has been removed.

In addition, the utilization of a paper or plastic wrapper requires that the tablet and/or briquette be formed prior to being wrapped and in a second step wrapped with the paper or plastic wrapping.

Accordingly, in certain applications a need exists for an inexpensive solid block wash chemical container which minimizes the possibility of skin contact with the wash chemical when placing the wash chemical in a dispenser; allows the solid wash chemical to be formed and packaged in a single step; and allows more than one wash chemical charge to be inserted into a dispenser at one time.

## Brief Description of the Drawings

FIGURE 1 is a perspective view of the container of this invention.

FIGURE 2 is a front view of the container of this invention.

## Summary of the Invention

The invention comprises a solid wash chemical contained in a vessel for dispensing a concentrated wash chemical solution from a solid block of wash chemical by means of a dispenser as e.g. described in EP-A-0225859. This dispenser includes a housing suitable for fixed predetermined mounting to a solid mounting surface. The dispenser can be mounted vertically or horizontally, directly to a washing apparatus to which the concentrated wash chemical solution is to be supplied, adjacent to such washing apparatus, or at a position remote from such washing apparatus.

The housing includes an upper cylindrical-storage portion for retainably holding a mass of solid block wash chemical, and defines an upwardly disposed access port through which solid block wash chemical is loaded into the housing. The access port is normally covered by a door mounted on the housing. The lower portion of the housing is configured in a funnel shaped collector portion that is downwardly covering to an outlet port, preferably in a funnel shape. The housing is designed for mounting such that the vertical height of the outlet port from the collector portion of the housing is higher than that of the wash chemical solution's utilization point. A conduit is connected to the outlet port of the housing for directing wash chemical solution therethrough by means of gravity feed from the collector portion of the dispenser to its utilization point. Alternatively, the wash chemical solution may be pumped from the collector portion of the dispenser to its utilization point.

A flat, generally horizontal continuous support screen is mounted to the inner walls of the housing at a position therealong defining the intersection of the upper storage portion and the lower collector portion of the housing. The support screen mesh size support the solid block of wash chemical without significantly impeding access of a water spray onto the lower face of the wash chemical (typically about 2,54 cm (1 inch)). Spray forming means are axially mounted in the collector portion of the housing.

The spray forming nozzle is connected to a pressurized source of water by means of a water supply line. Spray control means including a valve in the water supply line controls the flow of water to the spray-forming nozzle. In operation, the valve normally blocks water flow to the nozzle and is operative in its open position only upon receipt of an external control signal. Upon receipt of such a control signal, water flow is directed through the supply line and the nozzle and into engagement with substantially the entire lower surface of the support screen. Spray from the nozzle is of relatively low pressure (typically 0,68 to 1,7 atm (10 to 25 p.s.i.)) and wets only that portion of the solid block wash chemical carried immediately above the support screen. The dissolved wash chemical passes in solution through the support screen and is directed by the underlying collector portion of the housing to the outlet port thereof and through the conduit to its utilization point.

In the embodiment utilizing the wash chemical pump, the wash chemical solution pump is operative in response to a control signal from the utilization point (i.e. the washing machine). A float is positioned within the collector portion of the housing and operatively connected to the spray control means for controlling the flow of water to the nozzle, so as to maintain a constant level of wash chemical solution, below the nozzle, in the collector portion. When the level of wash chemical solution in the collector portion of the housing is below the desired constant level due to operation of the wash chemical pump, the spray control means is open to the flow of water therethrough and additional wash chemical solution is formed until the float returns to its desired level. The rate of creation of wash chemical solution should be slightly greater than the rate at which it is pumped out of the collector portion of the housing to prevent the entrainment of air. This type of dispenser is particularly useful when introducing the wash chemical solution into a pressurized line or tank or a remote utilization point and prevents the entrainment of air into the pump and early pump failure.

Optionally, a (0.63 to 0.13 cm (1/4 to 1/20 inch)) lower screen can be placed in the collector portion of the housing between the spray nozzle and the outlet port to catch any undissolved chunks of wash chemical small enough to pass through the support screen. This prevents small chunks of wash chemical collecting in the outlet port or the conduit connected thereto and blocking the flow of concentrated wash chemical solution out of the dispenser.

An electrically or mechanically actuated safety control switching circuit can be connected to sense the operative position of the door covering the access port to the housing and prevent water spray from the nozzle whenever the door is not in its closed position overlying the access port. This prevents the spray of concentrated wash chemical solution while an operator is loading the dispenser.

The solid block of wash chemical is housed in a deformable container having an open face and a removable cap or lid closing the open face.

The wash chemical may be cast or compressed directly into an open faced deformable container with the cap or lid attached to the container by means of a threaded fitting, a friction fitting, adhesive, etc. Preferably a paraffin wax coated cellulosic sheet is adhesively bonded to the leading edge of the container. At the point of use, the cap or lid is removed, the container inverted over the access port of the dispenser and the container distorted in order to break the bonds holding the solid block of wash chemical in the container, thereby allowing the solid block of wash chemical to fall from the container onto the support screen.

As used herein, the term "utilization point", when used in combination with wash chemical solution, refers to the place where the solution is used such as a wash tank, a rinse spray nozzle, etc.

As used herein, the term "wash chemical" refers to those chemical compounds or chemical mixtures commonly added to aqueous liquids present in machine washing units to aid in the cleaning and rinsing of fabrics and wares. Such wash chemicals include detergents, softeners, bleaches, rinse aids, etc.

For use in such a dispenser the solid block of wash chemical of this invention is packaged in an open faced, deformable container 500 as shown in Figs. 1 and 2 having the same cross-sectional shape as the internal cavity formed by the storage portion of the housing. The open face is covered with a paraffin wax coated cellulosic cap 510 adhesively bonded to an outwardly extending peripheral flange 504 extending along the plane defined by the open face 501. The open face 501 must have a cross-sectional area at least equal to and preferably slightly greater than the cross-sectional area throughout the remainder of the inner cavity 505 defined by the container 500. This is necessary to allow the block of wash chemical 80 contained within the container 500 to be removed from the container 500 as a single solid unitary block 80.

The container 500 may be made of any material which may be deformed enough to break the bonds between the solid block of wash chemical 80 and the container 500, thereby allowing the block of wash chemical 80 to fall from the container 500 when the container 500 is inverted. Preferably the container 500, and therefore the internal cavity as well, is a right circular cylinder. To aid in bonding the cap 510 to the container 500 and also to aid in removing the block of wash chemical 80 from the container 500 the container 500 preferably has an outwardly extending peripheral flange 504 lying in the plane defined by the

open face 501. The container 500 is preferably about 15.2 to 30.5 cm (6 to 12 inches) in diameter, about 2.54 to 10.2 cm (1 to 4 inches) thick and made of a flexible plastic such as polyethylene, polypropylene, polyvinyl chloride, etc.

At the point of use, the cap 510 is removed, the container 500 inverted over the access port of the dispenser, and the container 500 is distorted, breaking the bonds between the solid block of wash chemical 80 and the container 500, thereby allowing the block of wash chemical 80 to fall by gravity from the container 500 onto the support screen below. The container 500 and the cap 510 may then be discarded, the door placed in a closed position over the access port, and the dispenser is then ready for use. Preferably, the cross-sectional area of the solid block of wash chemical 80 is just slightly smaller than the cross-sectional area of the internal cavity defined by the storage portion of the housing, thereby allowing the solid block of wash chemical 80 to fall freely onto the support screen, yet preventing the passage of water sprayed from the nozzle between the inner wall of the storage portion and the lateral area 503 of the block of wash chemical 80 and into contact with other wash chemical blocks (not shown) contained above the wash chemical block 80 resting directly upon the support screen or up to the door.

Operation of the dispensing apparatus is relatively simple. A block of solid wash chemical 80 is loaded into the upper storage portion of the housing through the access port by removing cap 50, inverting container 500, open face 501 down, directly over the access port and "popping" the block of wash chemical 80 contained in container 500 onto the support screen. Therefore, the cross-sectional area of the wash chemical block 80 should be about the same size as the cross-sectional area of the inner cavity to allow the block to rest flatly upon the support screen and also prevent water spray from passing between the lateral surface area 503 of wash chemical block 80 and the inner wall and wetting other wash chemical blocks above or spraying onto the door.

To be able to "pop-out" the block of wash chemical 80, the container 500 must have an open face 501 at least as large and preferably slightly larger, than its base 502 and must have no inner peripheral bumps, ridges or edges which can prevent the solid block of wash chemical 80 from sliding out of the container 500. To load the dispenser, the door must be lifted to an upright position before inverting container 500 over the access port. The housing will typically hold 31.0 to 1.5 kg. blocks of wash chemical 80 but can be readily sized to hold up to 5 or 6 blocks. However, it will be understood that other sizes could equally well be configured within the scope of this invention.

When provided with fluid flow therethrough, the spray-forming nozzle will direct a spray pattern at the bottom surface of the support screen, wetting that wash chemical 80 carried immediately thereabove, which dissolves and passes in solution through the support screen to the collector portion of housing. Thus, concentrated wash chemical solution is produced in this arrangement of the apparatus, whenever the rinse valve is opened and the door member is closed.

The concentrated detergent solution passes through the outlet port of the housing member and is directed by the conduit to its utilization point.

#### Wash Chemical Compositions

Disclosed below is a nonexhaustive list of wash chemical compositions which may be cast or compressed into solid blocks 80 and utilized in the present invention.

Example I

5	<u>Laundry Detergent (Low Alkalinity)</u>	
	<u>Raw Material</u>	<u>Percent</u>
	Polyethylene oxide M.W. 8000	25.40
	Neodol 25-7, Linear Alcohol	30.0
10	Ethoxylate (1)	
	Dimethyl distearyl ammonium chloride	3.0
	Tinopal CBS, Optical Dye (2)	0.1
15	Carboxymethyl cellulose	1.5
	Sodium tripolyphosphate	35.0
	Sodium metasilicate	5.0
20		<hr/>
		100.0

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 (1) Trade name - Shell Chemical Co.

(2) Trade name - Ciba Geigy

30 The polyethylene oxide and the dimethyl distearyl ammonium chloride are mixed together and melted at a temperature of about 71 to 82 °C (160 to 180 °F). The remaining items are then added to the melt and mixed until a uniform product is obtained, about 10 to 20 minutes. The mixed product thusly obtained is then poured into a container 500 and cooled below its melting point which is about 60 °C (140 °F).

Example II

35	<u>Neutral Hard Surface Cleaner</u>	
	<u>Raw Material</u>	<u>Percent</u>
	Nonyl phenol ethoxylate 15 moles of	80.0
40	ethylene oxide	
	Polyethylene oxide M.W. 8000	20.0
45		<hr/>
		100.0

50 The nonyl phenol ethoxylate 15 moles of ethylene oxide and polyethylene oxide are mixed together and melted at a temperature of about 71 to 82 °C (160 to 180 °F). The product is then poured into a container 500 and cooled below its melting point which is about 66 °C (150 °F).

Example IIIHigh Alkaline Industrial Laundry Detergent

5	<u>Raw Material</u>	<u>Percent</u>
	Sodium hydroxide - 50 %	26.00
	Dequest 2000 (1)	17.00
10	Polyacrylic acid - 50 % M.W. 5000	6.50
	Nonylphenol ethoxylate 9.5 mole ratio	14.00
	Tinopal CBS (2)	0.075
15	Sodium hydroxide	36.425
		<hr/>
		100.0

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- 20 (1) Trademark - Monsanto Chemical Co.  
(2) Trademark - Ciba-Geigy

25 All ingredients except the sodium hydroxide are mixed together and melted at a temperature of about 77 °C (170 ° F). The sodium hydroxide is then added and mixed until a uniform product is obtained. The product is poured into a container 500 and cooled.

Example IV

30	<u>Institutional Dishwashing Detergent</u>	
	<u>Raw Material</u>	<u>Percent</u>
35	Sodium hydroxide 50 % solution	50.0
	Sodium hydroxide bead	25.0
	Sodium tripolyphosphate	25.0
40		<hr/>
		100.0

The sodium hydroxide bead is added to the sodium hydroxide 50 % solution, heated to 79 °C (175 ° F) and mixed. The sodium tripolyphosphate is then added and mixed until uniform, about 10 to 20 minutes.  
45 This mixture is poured into a container 500 and cooled rapidly to solidify the product.

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Example VSolid Rinse AidRaw MaterialPercent

Polyethylene glycol (M.W. 8000)

30.0

Sodium xylene sulfonate

20.0

Pluronic (1) L62

40.0

Pluronic (1) F87

10.0

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100.0

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(1) - BASF Wyandotte trademark for ethyleneoxide-  
propyleneoxideblock copolymers.

The polyethylene glycol is melted at a temperature of about 71 °C (160° F). The sodium xylene sulfonate granules or flakes are added and mixed into the polyethylene glycol melt. Pluronic L62 and F87 are then added and mixed until the melt is uniform, about 10 to 20 minutes. The mixture is then poured into container 500 and allowed to cool and solidify. Other modifications of the invention will be apparent to those skilled in the art in light of the foregoing description. This description is intended to provide concrete examples of individual embodiments clearly disclosing the present invention. Accordingly, the invention is not limited to these embodiments or to the use of specific elements therein. All alternative modifications and variations of the present invention which fall within the spirit and broad scope of the appended claims are covered.

Example VIComparative Dispensing Tests

A capsule and a container were each charged with approximately 3.63 kilograms (8 lbs.) of the laundry detergent described in Example I. The detergent in the container was dispensed utilizing the dispenser of EP-A-0225859 (i.e. "popping out" the block of detergent onto a support screen and spraying water upon the downwardly facing surface of the detergent block). The detergent in the capsule was dispensed by inverting the capsule over a spray nozzle and spraying water into the capsule and onto the exposed surface of the detergent contained in the capsule. The means of dispensing the detergent from the capsule and the container was the same except that the detergent in the container was removed from the container and placed onto a support screen so that the distance between the spray nozzle and the exposed dissolving surface of the detergent would remain constant throughout use of the detergent, while the detergent in the capsule was dispensed from within the capsule such that as the detergent in the capsule was utilized the distance between the spray nozzle and the exposed dissolving surface of the detergent would increase.

When approximately 3.63, 2.72, 1.81 and 0.91 kg (8, 6, 4 and 2 lbs.) of detergent were remaining (determined for the capsule by weighing the capsule and determined for the container by titrating a sample of the total concentrated detergent solution formed and measuring the amount of solution formed in accordance to the equation shown below) an amount of detergent dispensed during subsequent dispensing sprays of 20 seconds was calculated by titrating 5 samples of the concentrated detergent solution created during 5 20-seconds tests and averaging the results.

The amount of detergent dispensed was calculated by making a standard 1 wt-% solution of the detergent and titrating 100 g. of the 1 wt-% detergent solution to a pH of 8.3 with a 0.1 N acid standard to determine the volume of standard required to reach the equivalence point (pH 8.3) for 1 gram of detergent. The volume required was a constant of 12.7 ml. A 100 g. sample of the solution formed during each 20-second test was then titrated with the 0.1 N acid standard and the volume of standard used to reach the equivalence point (pH 8.3) recorded. The data obtained is then placed into the following equation and the

total amount of detergent dispensed during the 20-second test calculated.

5	Detergent	Total Volume of Concentrated	Standard Titrated	<u>1</u>
	dispensed (grams) =	Solution	<u>(ml)</u>	100
		Dispensed (ml)	( 12.7 ml)	

10 With respect to the capsule, the 3.63, 2.72, 1.81 and 0.91 kg (8, 6, 4 and 2 lbs.) of detergent remaining in the capsule correlated approximately to a distance between the nozzle and the exposed surface of the detergent of about 3.81, 6.35, 8.89 and 11.43 cm (1.5, 2.5, 3.5 and 4.5 inches) respectively. The constant distance between the nozzle and the downwardly facing surface of the solid block of detergent from the container was 4.5 cm (1.75 inches).

15 Data was collected for spray pressures of 0.68, 1.02, 1.36 and 1.7 (10, 15, 20, and 25 p.s.i.) (those normally used in such dispensers) and the results tabulated in Table 1 and graphically depicted in Figs. 3 to 6. As can readily be seen from the capsule data, the amount of detergent dispensed over a constant period of time (in this case 20 seconds) decreases as the distance between the nozzle and the exposed dissolving surface of the detergent increases. Utilizing the said dispenser, the distance between the nozzle  
20 and the exposed surface of the detergent remains constant as the detergent is utilized, and as can be seen maintains the amount of detergent dispensed over a constant period of time relatively constant.

As Example VI shows, the actual concentration of the wash chemical solution dispensed is dependent upon the distance between the nozzle and the exposed surface of the wash chemical. Therefore, if the dissolving wash chemical is dispensed on a timed basis the actual amount of wash chemical dispensed will  
25 vary. The dispenser eliminates this variable by maintaining a constant distance between the nozzle and the exposed surface of the wash chemical and thereby increases the reliability of dispensers which dispense wash chemical based upon spray time only.

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Container Constant

	Spray Pressure (atm.)	Product Remaining in Dispenser (kg)	Product Dispensed in 20 Sec. (G)
5	-----	-----	-----
	0.68	3.63	10.75
10		2.72	8.57
		1.81	10.52
		0.91	11.75
	1.02	3.63	18.75
15		2.72	16.41
		1.81	15.80
		0.91	19.20
20	1.36	3.63	19.51
		2.72	18.75
		1.81	16.50
		0.91	19.47
25	1.70	3.63	26.52
		2.72	24.72
		1.81	28.51
30		0.91	27.53

Capsule (Increasing Distance)

35	0.68	3.63	9.60
		2.72	5.85
		1.81	2.05
		0.91	1.35
40	1.02	3.63	15.25
		2.72	7.45
		1.81	5.40
		0.91	3.40
45	1.36	3.63	18.00
		2.72	11.55
		1.81	7.75
50		0.91	6.20

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	1.70	3.63	23.00
		2.72	23.00
5		1.81	13.70
		0.91	8.20

## 10 Claims

1. An article of commerce comprising a solid wash chemical contained in a vessel, characterized in that the article comprises a three-dimensional, solid, substantially orthogonal block (80) of wash chemical and a substantially orthogonal vessel (500) having an open face (501) and leading edge, the vessel (500) surrounding and in contact with the block (80) of wash chemical on all but one surface thereof, the vessel (500) being distortable to break bonds holding the solid block (80) of wash chemical in the vessel (500) until such distortion, and the crosssectional area of the open face (501) being sufficient to allow passage of the entire block (80) of wash chemical therethrough.
2. The article of Claim 1 further comprising an outwardly extending flange (504) integrally connected with the leading edge.
3. The article of Claim 1 further comprising a cover (510) across the open face of the vessel (500), the cover (510) removably coupled to the leading edge of the vessel (500) for completely enclosing the block (80) of wash chemical.
4. The article of Claim 1 wherein the vessel (500) comprises a deformable molded plastic.
5. The article of Claim 1, wherein the block (80) of wash chemical is an orthogonal circular cylinder with a diameter of about 10.2 cm - 38.1 cm (4 - 15 inches) and a height of about 2.54 cm - 20.3 cm (1 - 8 inches).
6. The article of Claim 1, comprising a three-dimensional, solid, inwardly tapered block (80) of wash chemical and an inwardly tapered vessel.
7. The article of any one of Claims 1 to 6, wherein the wash chemical comprises a rinse aid comprising 20 to 40 wt-% polyglycol having a molecular weight of approximately 8000; 10 to 30 wt-% alkaline earth xylene sulfonate and 40 to 60 wt-% of an ethyleneoxide-propyleneoxide block copolymer.
8. The article of Claim 7, comprising an orthogonal circular cylinder of said solid rinse aid, having a diameter of about 12.7 cm - 17.8 cm (5 - 7 inches) and a height of about 5.1 cm - 10.2 cm (2-4 inches) and an orthogonal, circular cylinder deformable molded plastic vessel (500) having an open face (501), a leading edge and an outwardly extending flange (504) integrally connected with the leading edge, the vessel surrounding and in contact with the rinse aid (80) on all but one surface thereof; and a cover (510) across the open face of the vessel (500), the cover removably coupled to the flange (504) for completely enclosing the rinse aid.
9. The article of Claim 1, wherein the wash chemical comprises a solid mixture of sodium hydroxide, sodium tripolyphosphate and water.
10. The article of Claim 9, wherein the wash chemical comprises 50 wt-% sodium hydroxide, 25 wt-% sodium tripolyphosphate and 25 wt-% water.
11. The article of Claim 9 or 10, wherein the wash chemical further comprises sodium silicate.

Fig. 1

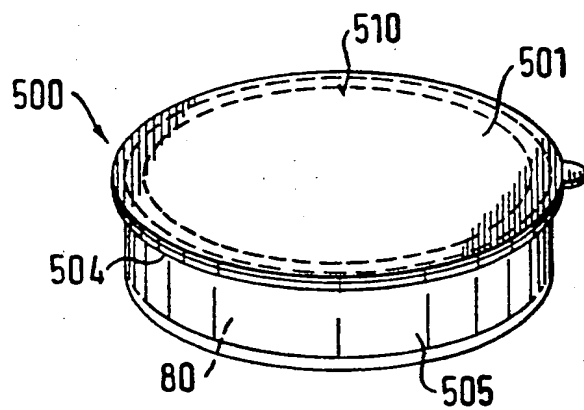


Fig. 2

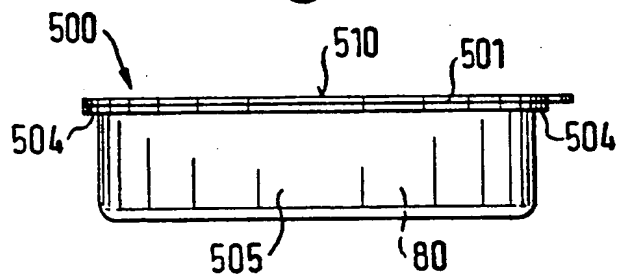


Fig. 3

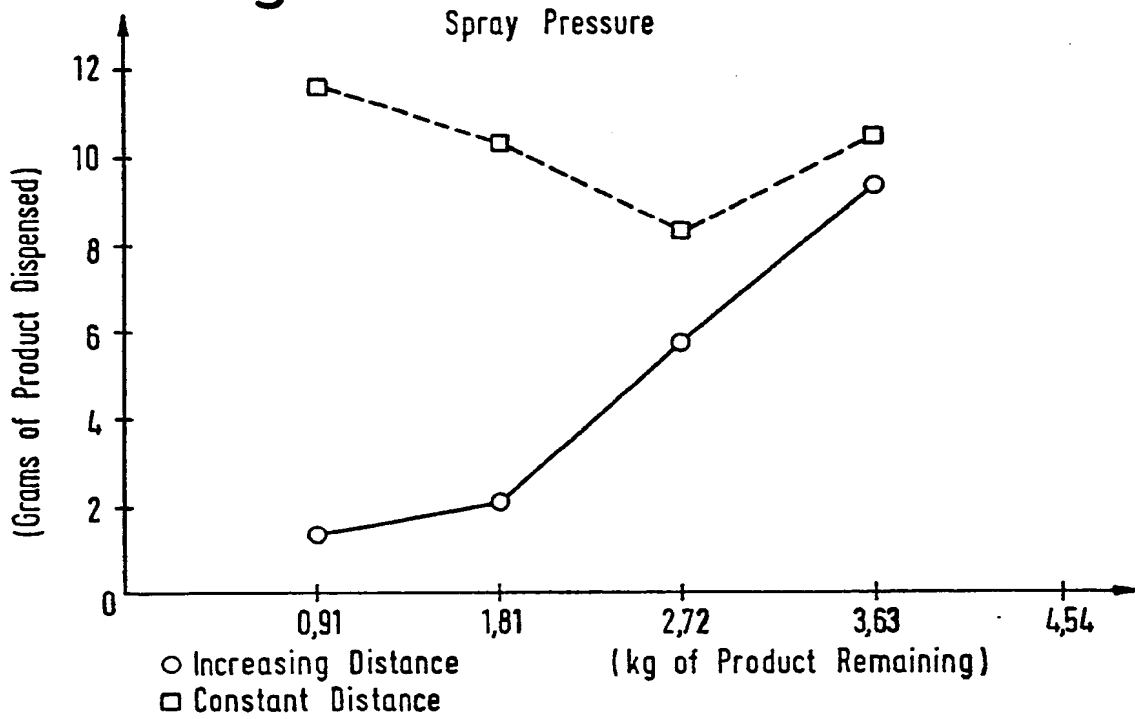


Fig. 4

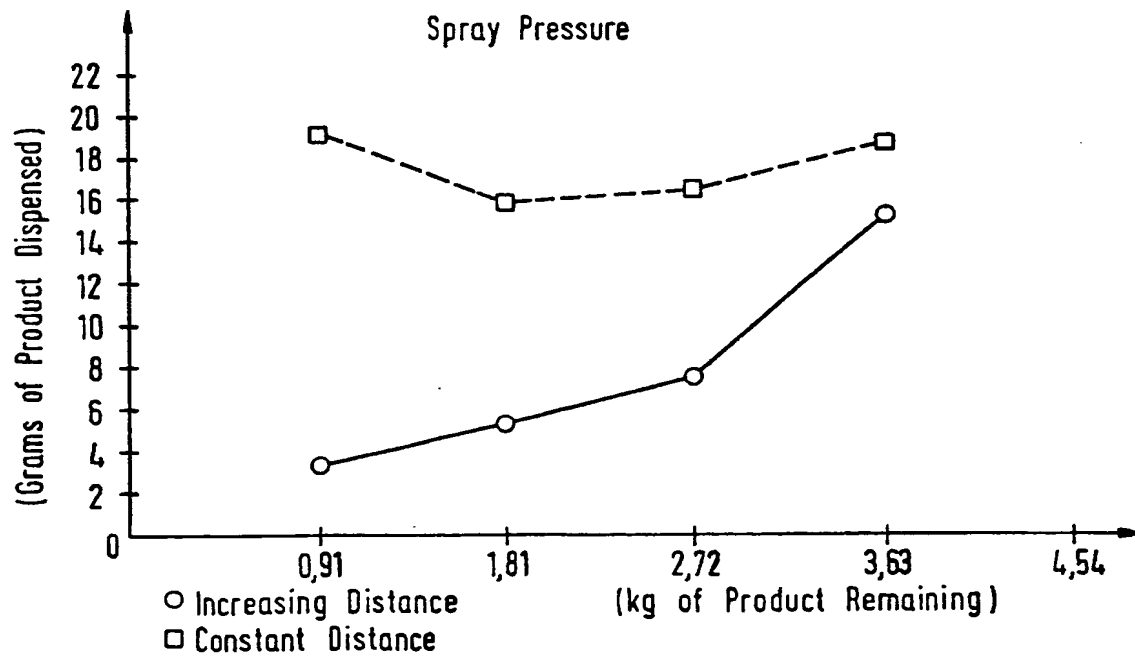


Fig. 5

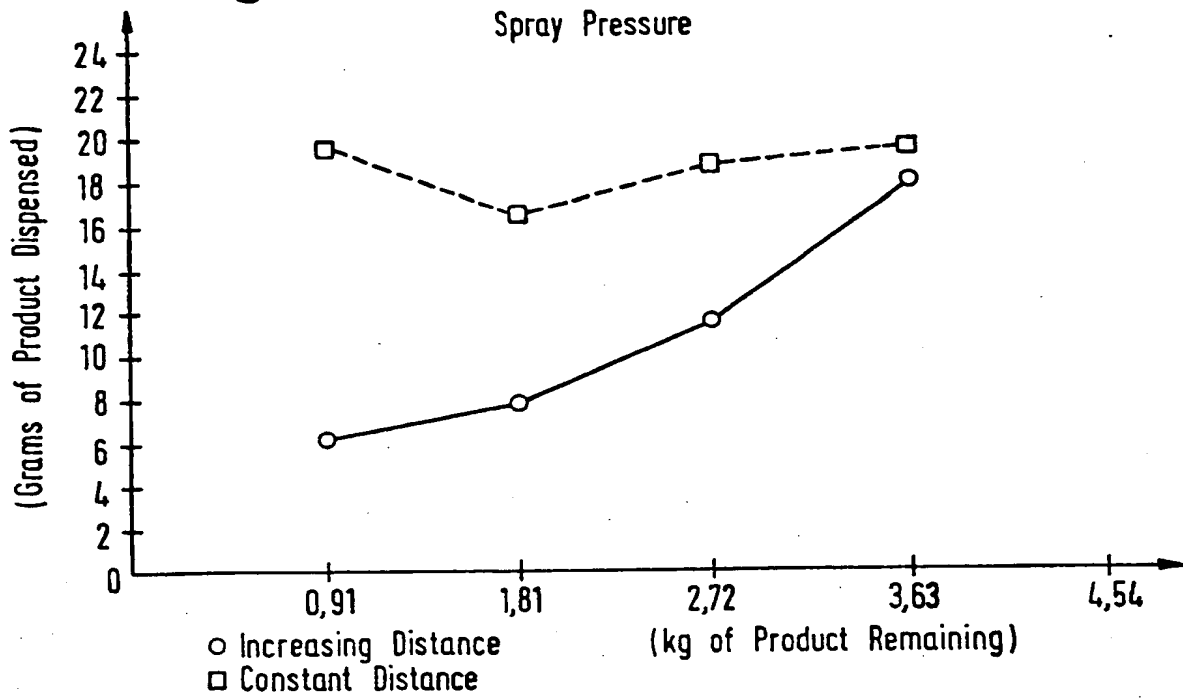
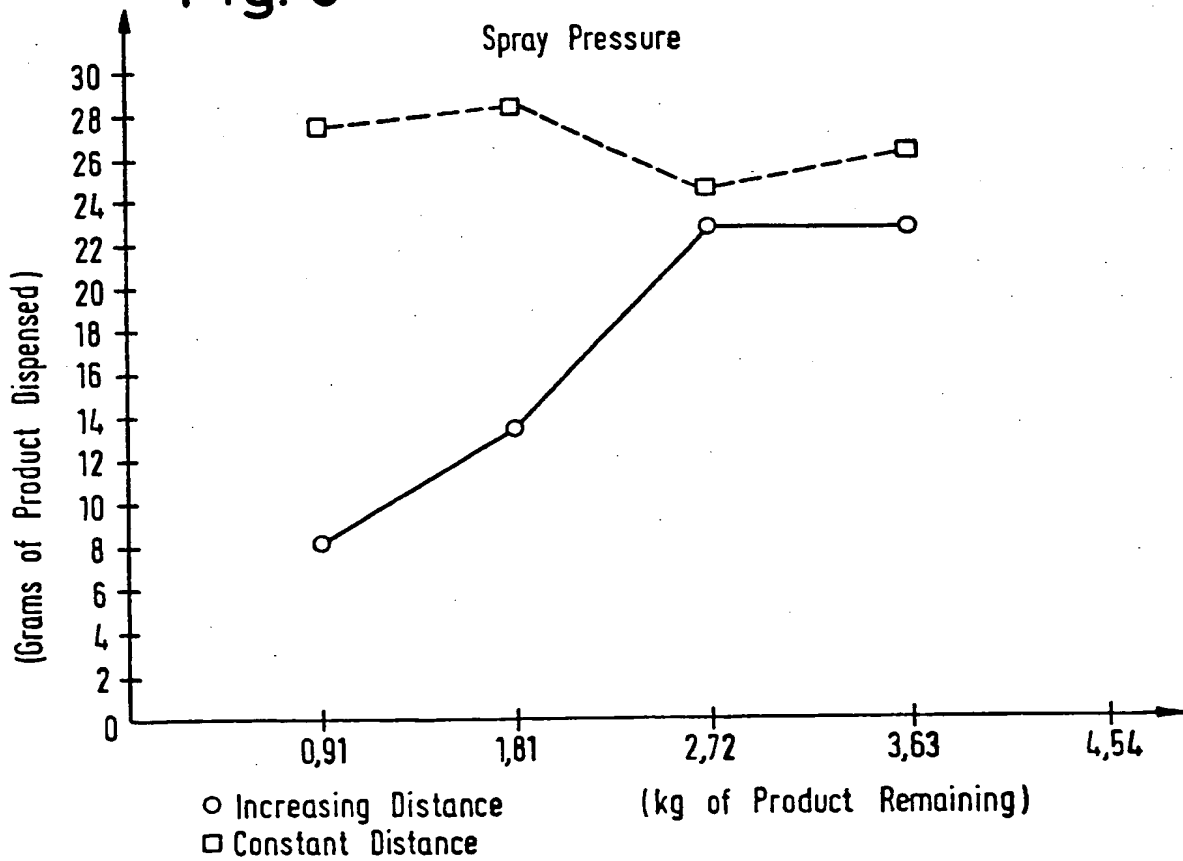


Fig. 6





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Patent Office

## EUROPEAN SEARCH REPORT

Application Number

EP 91 11 1637

### DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	US-A-3 079 057 (COLARUSSO) * column 2, line 3 - line 14; figure 1 **	1-11	B 65 D 77/20
Y	---	1-11	
Y	US-A-3 272 899 (DIAMOND ET AL.) * column 2, line 37 - line 40 **	1-11	
X	US-A-1 735 219 (STEELE ET AL.) * figure 2 **	1-3,5-11	
A	CA-A-1 125 621 (ECONOMICS LABORATORY) * page 11, paragraph 1; figures 1-4 **	1-4,6,8,9	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			B 65 D A 47 L
The present search report has been drawn up for all claims			
Place of search		Date of completion of search	Examiner
The Hague		19 September 91	BEUGELING G.L.H.
<div><div><b>CATEGORY OF CITED DOCUMENTS</b> X: particularly relevant if taken alone Y: particularly relevant if combined with another document of the same category A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention</div><div>E: earlier patent document, but published on, or after the filing date D: document cited in the application L: document cited for other reasons ----- &amp;: member of the same patent family, corresponding document</div></div>			